

US009636531B1

# (12) United States Patent Silva, Jr. et al.

## (54) DRY SPRINKLER

(71) Applicant: TYCO FIRE PRODUCTS LP,

Lansdale, PA (US)

(72) Inventors: Manuel R. Silva, Jr., Cranston, RI

(US); Thomas E. Archibald, Providence, RI (US); James W. Mears, Warwick, RI (US); Donald B. Pounder, North Kingston, RI (US); Yoram Ringer, Providence, RI (US)

(73) Assignee: **Tyco Fire Products LP**, Lansdale, PA

(US)

(\*) Notice: Subject to any disclaimer, the term of this

patent is extended or adjusted under 35

U.S.C. 154(b) by 0 days.

This patent is subject to a terminal dis-

claimer.

(21) Appl. No.: 14/271,164

(22) Filed: May 6, 2014

#### Related U.S. Application Data

- (63) Continuation of application No. 13/185,196, filed on Jul. 18, 2011, now Pat. No. 8,746,356, which is a continuation of application No. 12/833,623, filed on Jul. 9, 2010, now Pat. No. 8,528,653, and a continuation of application No. 12/835,445, filed on Jul. 13, 2010, now Pat. No. 8,469,112, which is a (Continued)
- (51) Int. Cl.

  A62C 37/08 (2006.01)

  A62C 35/00 (2006.01)

  A62C 35/62 (2006.01)

  A62C 35/68 (2006.01)
- (52) **U.S. Cl.**CPC ...... *A62C 35/68* (2013.01); *A62C 35/62* (2013.01)

# (10) Patent No.: US 9,636,531 B1

(45) **Date of Patent:** \*May 2, 2017

#### (58) Field of Classification Search

CPC ........ A62C 37/08; A62C 37/11; A62C 37/14; A62C 31/02; A62C 35/62 See application file for complete search history.

# (56) References Cited

#### U.S. PATENT DOCUMENTS

269,930 A 1/1883 Harris 306,662 A 10/1884 Stratton (Continued)

#### FOREIGN PATENT DOCUMENTS

AU 199865360 9/1998 CA 2462636 8/2005 (Continued)

#### OTHER PUBLICATIONS

Plaintiff Tyco—Second Amended Complaint, (13 pages) (Oct. 4, 2010).

(Continued)

Primary Examiner — Darren W Gorman (74) Attorney, Agent, or Firm — Perkins Coie LLP

### (57) ABSTRACT

A dry sprinkler for a fire protection system. The preferred dry sprinkler has a metallic disc annulus positionable within a passageway to skew a central axis of a face of the metallic disc annulus with respect to a longitudinal axis of the dry sprinkler so that an expected minimum flow rate based on a rated discharge coefficient is provided. The dry sprinkler operates to provide an expected flow rate over a range of start pressures. The expected flow rate is based on a K-factor rating. The dry sprinkler provides an acceptable level of fluid flow rate from the expected flow rate based on the K-factor for a range of start pressures.

# 45 Claims, 50 Drawing Sheets

